



Nemko Test Report: 12296RUS1

Applicant: Fiber-Span
111 Corporate Blvd., S
Plainfield, NJ 07080
USA

Equipment Under Test: FS31H-4 RF BDA
(E.U.T.)

In Accordance With: **CFR 47 Part 90, Subpart I**
Private Land Mobile Repeater

Tested By: Nemko USA Inc.
802 N. Kealy
Lewisville, TX 75057-3136

TESTED BY: 

David Light, Senior Wireless Engineer

DATE: 27 June, 2008

APPROVED BY: 

Mike Cantwell, Frontline Manager

DATE: 27 June, 2008

Number of Pages: 31

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Section 1. Summary of Test Results

Manufacturer: Fiber-Span

Model No.: FS31H-4X-USR

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR Part 90, Subpart I.

<input checked="" type="checkbox"/>	New Submission	<input checked="" type="checkbox"/>	Production Unit
<input type="checkbox"/>	Class II Permissive Change	<input type="checkbox"/>	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".



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Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	90.205	Complies
Occupied Bandwidth	90.210	Complies
Spurious Emissions at Antenna Terminals	90.210	Complies
Field Strength of Spurious Emissions	90.210	Complies
Frequency Stability	90.213	NA

Footnotes For N/A's:

- (1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
- (2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.

Section 2. General Equipment Specification**Transmitter****Supply Voltage Input:** 120 Vac**Frequency Range:** 464-469 MHz Downlink
457-462 MHz Uplink**Tunable Bands:****Type(s) of Modulation:**

F3E (Voice)	F1D	F2D	D7W (QAM)	Other
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Gain: 82 dB max**Output Impedance:** 50 ohms**RF Power Output (rated):**

<u>4</u>	W
<u>36</u>	dBm

Selection of Operating Frequency: None**Power Output Adjustment Capability:** Manual**Frequency Translation:**

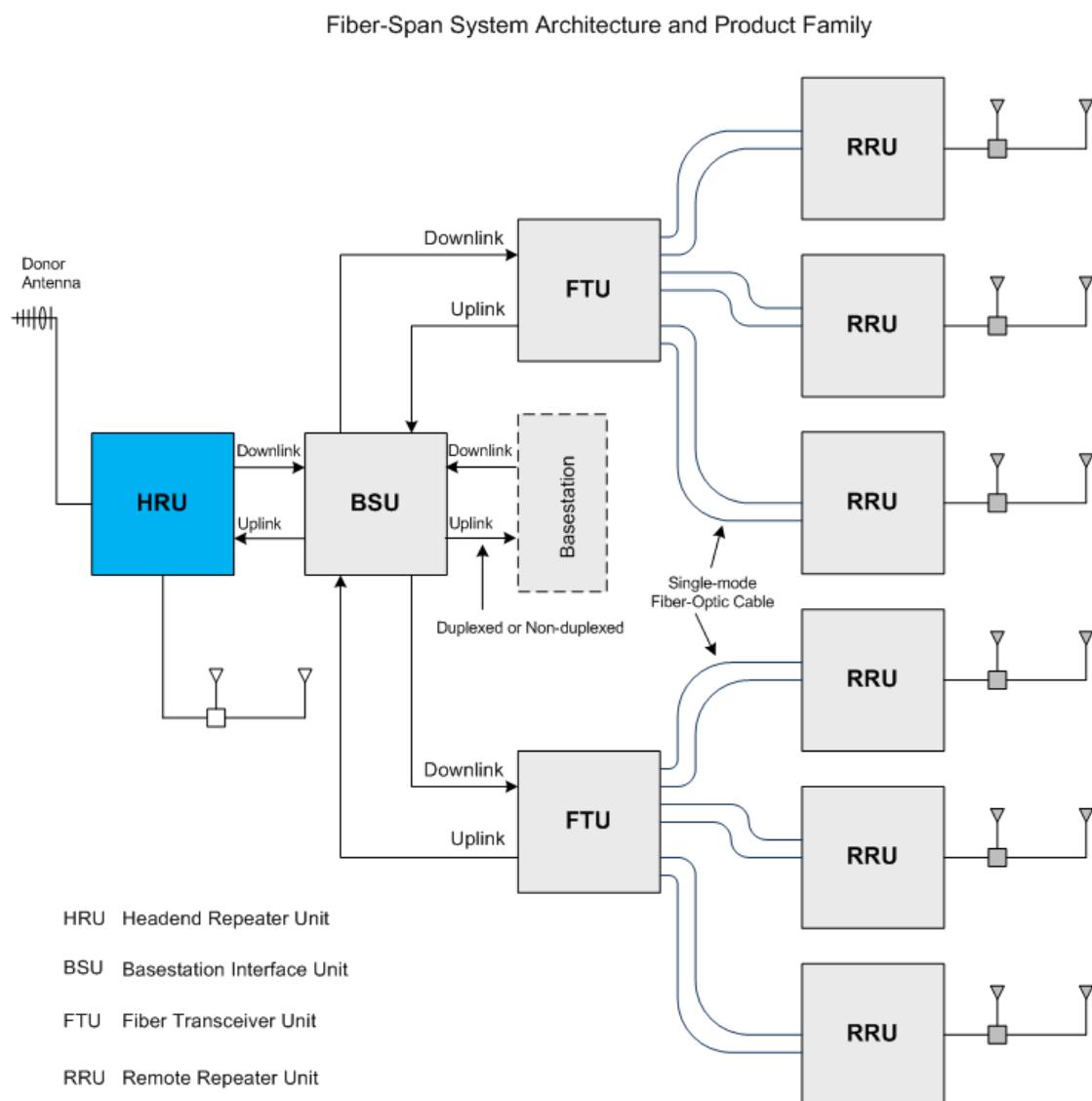
F1-F1	F1-F2	N/A
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Band Selection:

Software	Duplexer Change	Fullband Coverage
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Description of EUT

The HRU amplifies RF frequencies in both the downlink and uplink paths with duplexers that provide both downlink and uplink frequency bands on a single distributed antenna system. The HRU is used to provide cost efficient wireless coverage in areas that have poor coverage

System Diagram

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 25 June 2008

Test Results: Complies.**Measurement Data:**

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	Analog	33	36	4.0
Downlink	Analog	33	36	4.0

Equipment Used: 1659-1082-1472-1469**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %

Section 4. Occupied Bandwidth

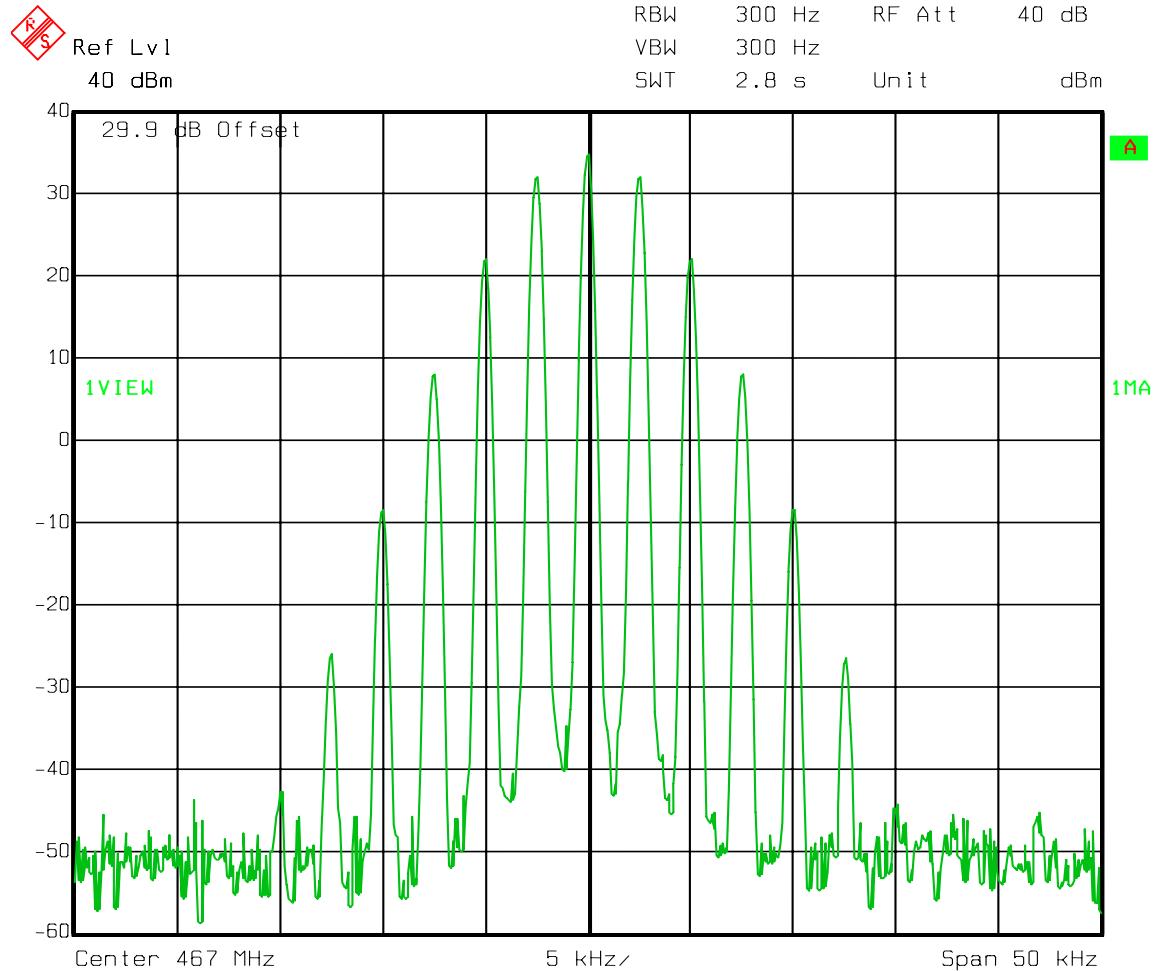
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 25 June 2008

Test Results: Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1659-1082-1472-1469**Measurement Uncertainty:** 1X10⁻⁷ ppm**Temperature:** 22 °C**Relative Humidity:** 35 %

Test Data – Occupied Bandwidth

Downlink / Output

2.5 kHz Tone / 3 kHz Deviation



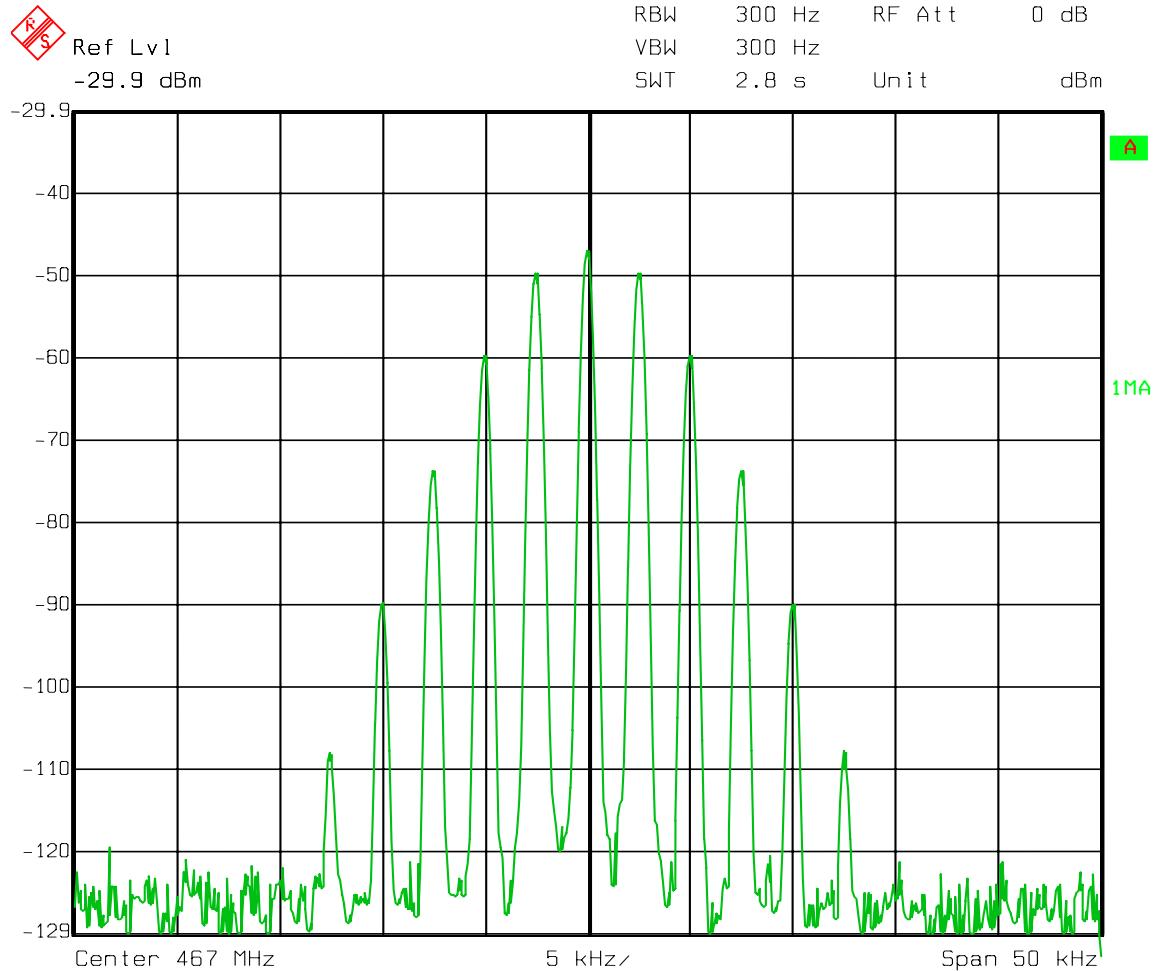
Date: 26.JUN.2008 09:12:54

EQUIPMENT: FS31H-4X-USR

Test Data – Occupied Bandwidth

Downlink / Input

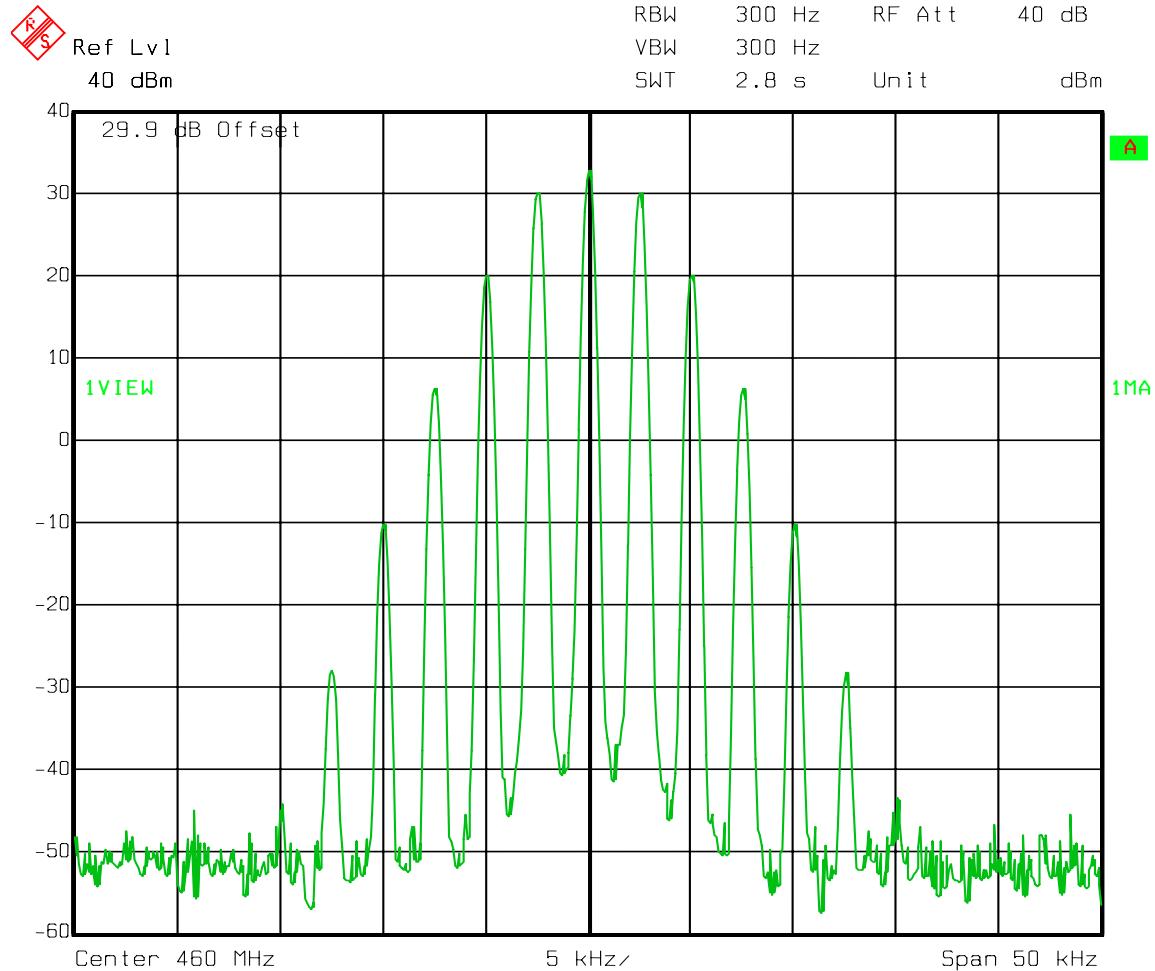
2.5 kHz Tone / 3 kHz Deviation



Test Data – Occupied Bandwidth

Uplink / Output

2.5 kHz Tone / 3 kHz Deviation



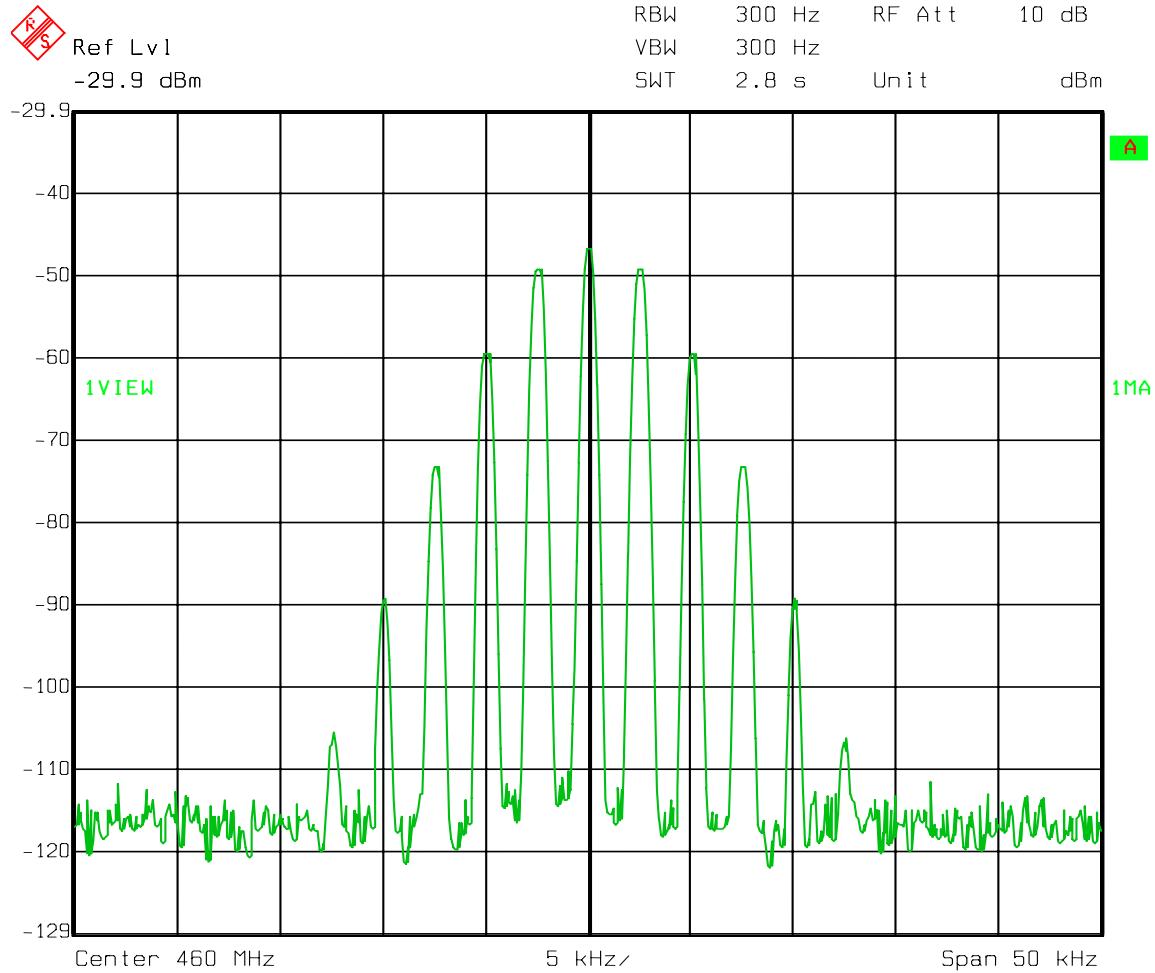
Date: 26.JUN.2008 09:34:44

EQUIPMENT: FS31H-4X-USR

Test Data – Occupied Bandwidth

Uplink / Input

2.5 kHz Tone / 3 kHz Deviation



Date: 26.JUN.2008 09:36:13

Section 5. Spurious Emissions at Antenna Terminals

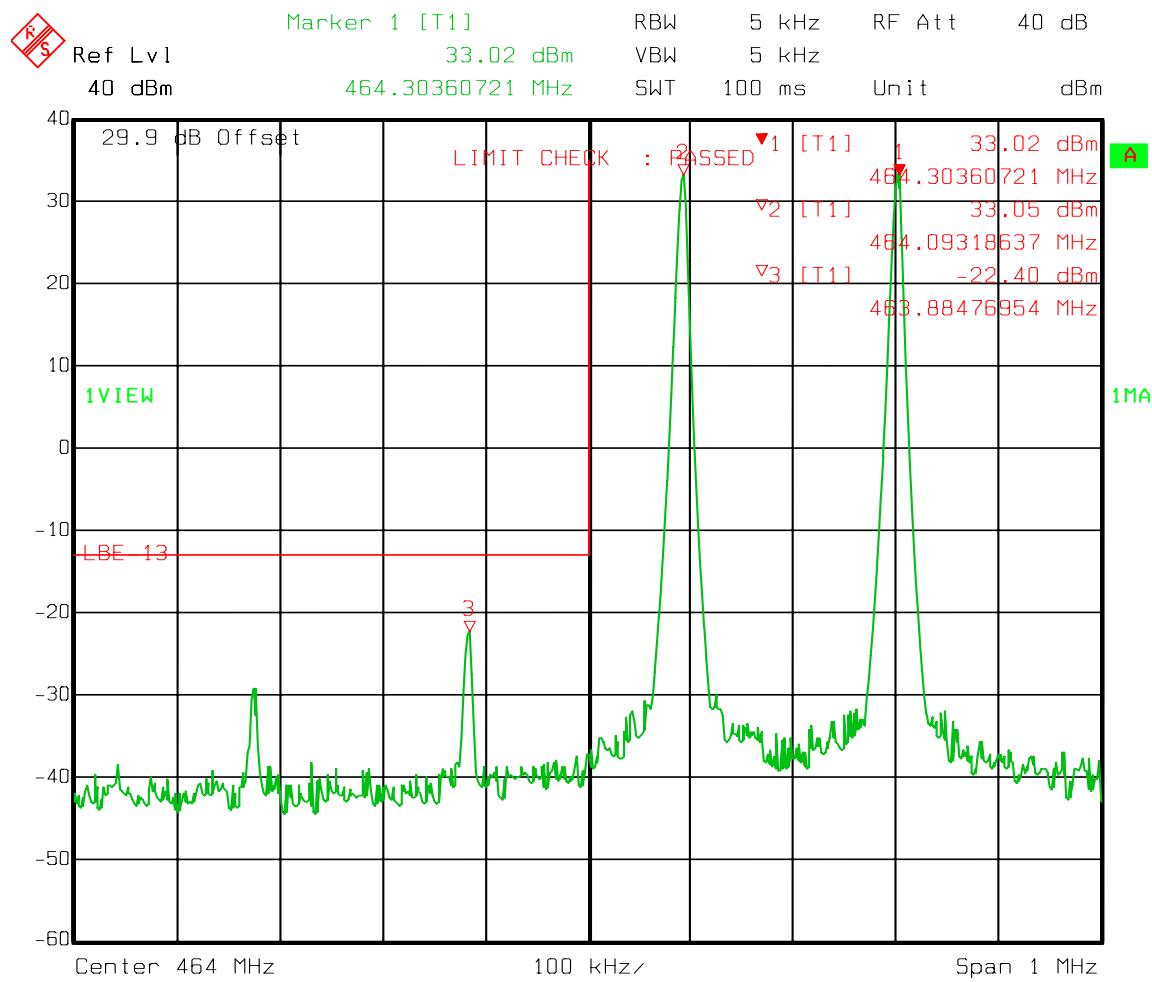
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 25 June 2008

Test Results: Complies.**Test Data:** See attached plot(s).**Equipment Used:** 1659-1082-1472-1469**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %

Test Data – Spurious Emissions at Antenna Terminals

Low Band Edge

Downlink

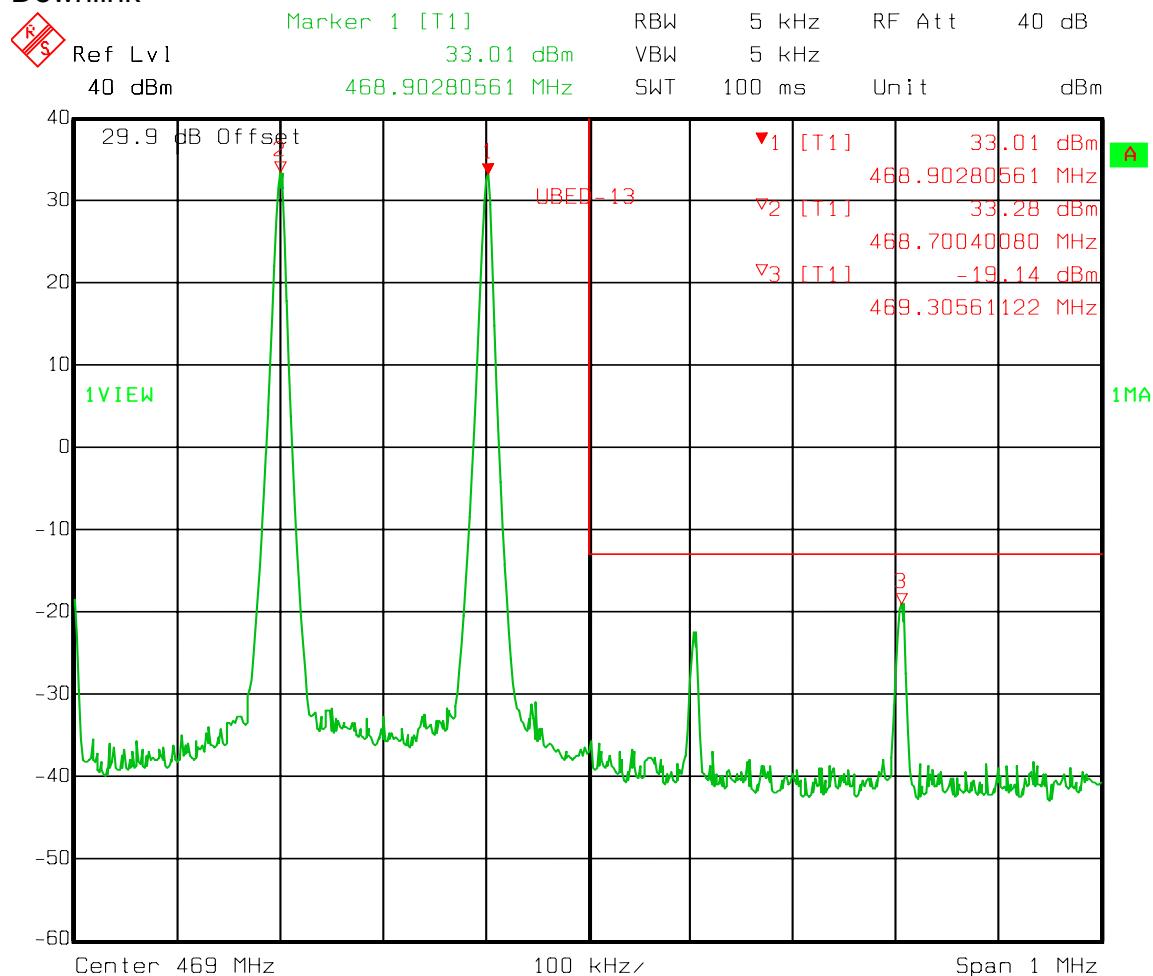


Date: 26.JUN.2008 09:50:15

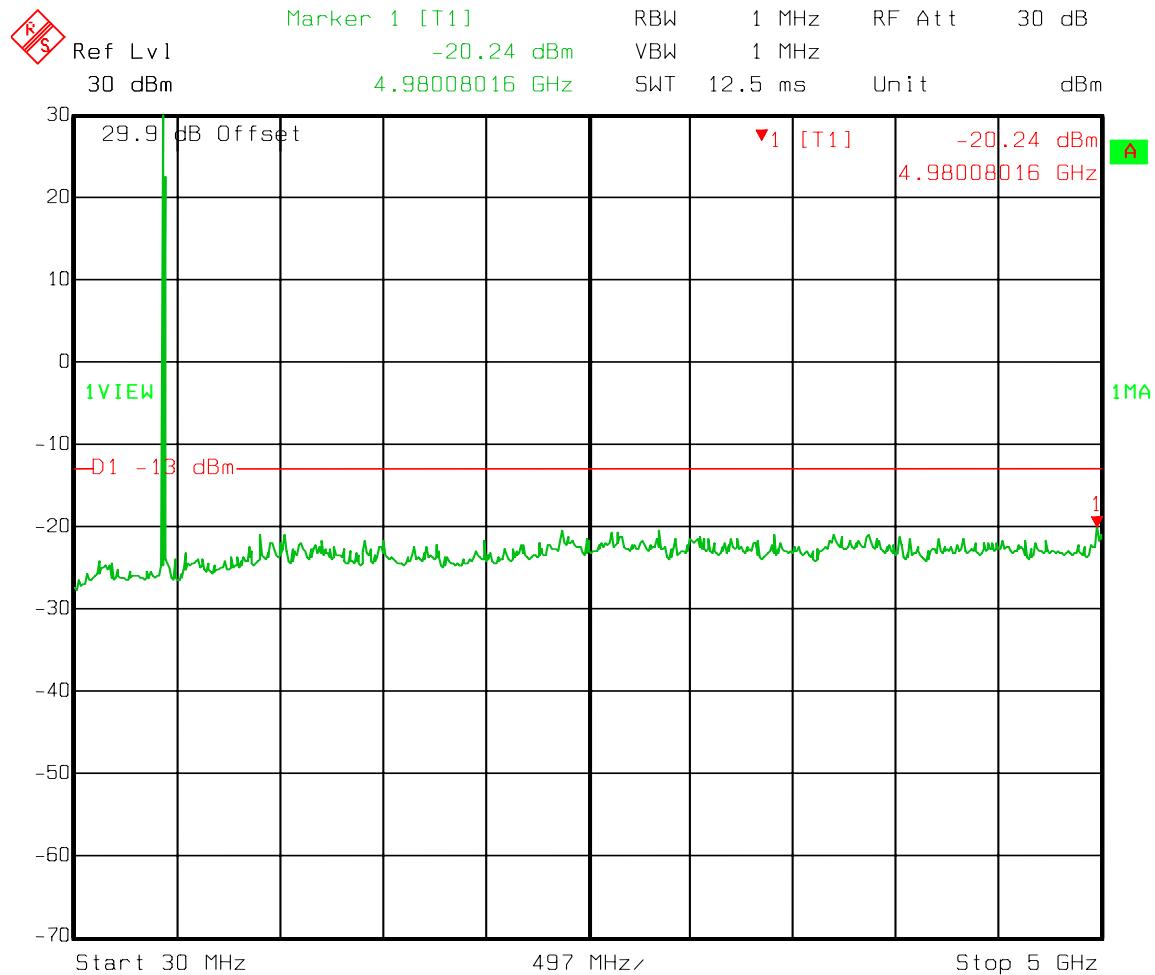
Test Data – Spurious Emissions at Antenna Terminals

Upper Band Edge

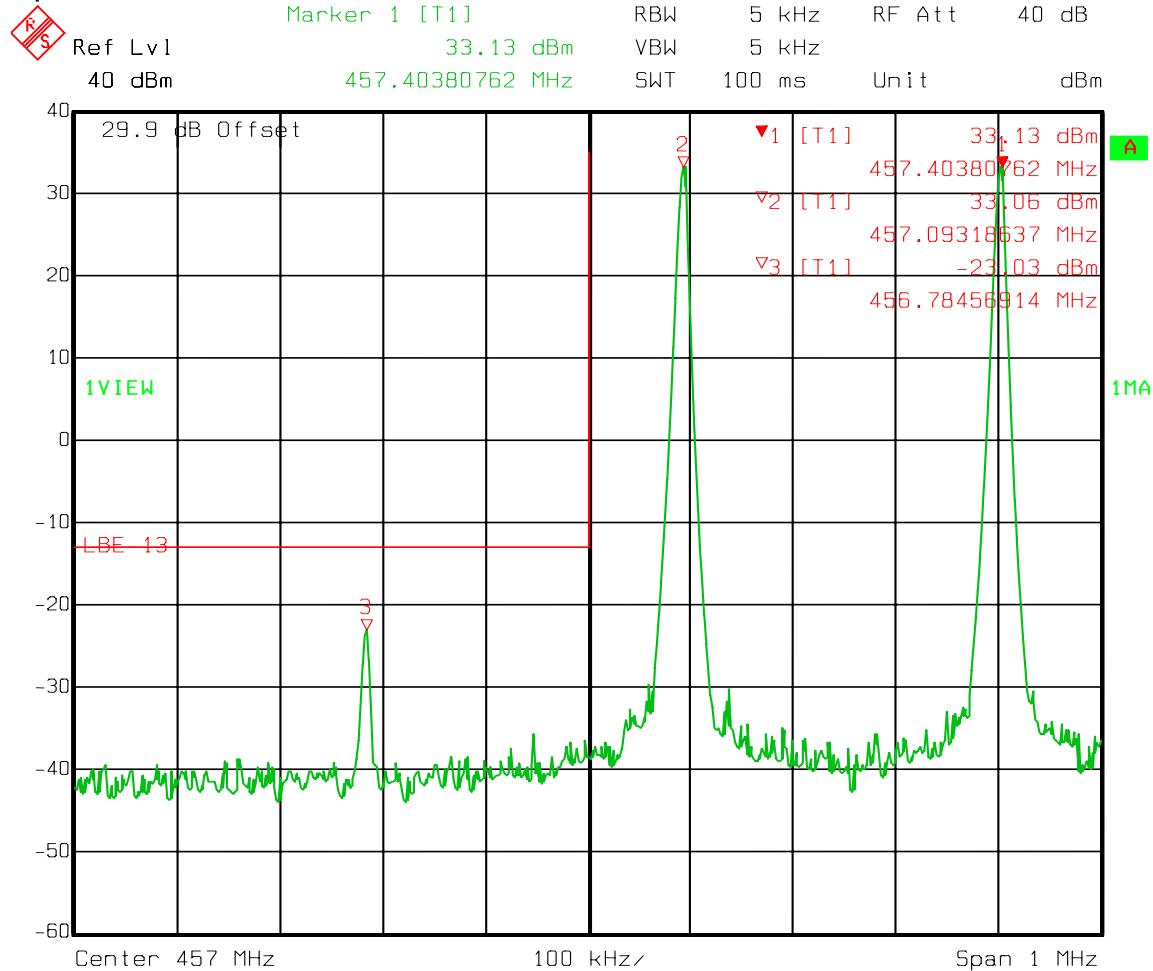
Downlink



Date: 26.JUN.2008 09:08:33

Test Data – Spurious Emissions at Antenna Terminals**Spurs****Downlink**

Date: 26.JUN.2008 09:02:44

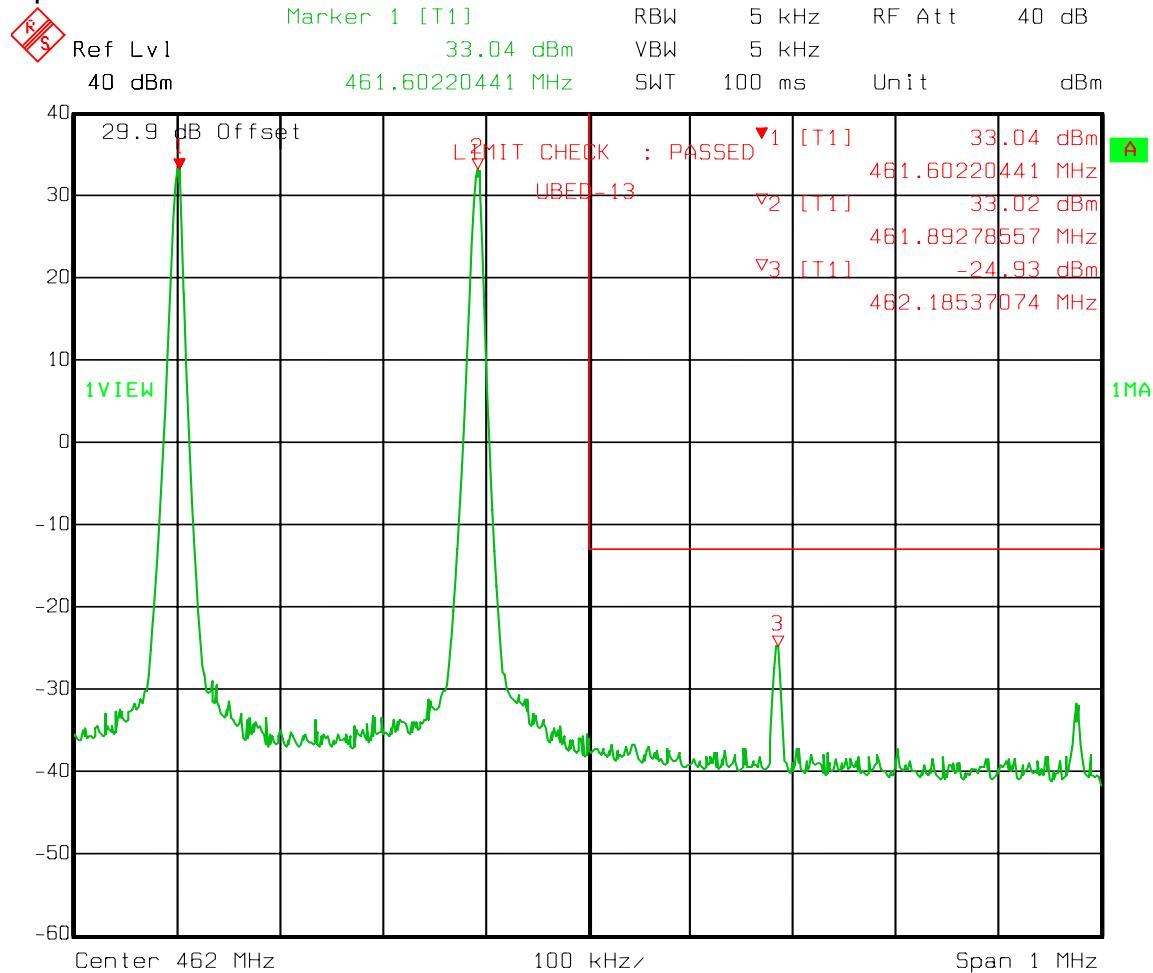
Test Data – Spurious Emissions at Antenna Terminals**Low Band Edge****Uplink**

Date: 26.JUN.2008 10:13:36

Test Data – Spurious Emissions at Antenna Terminals

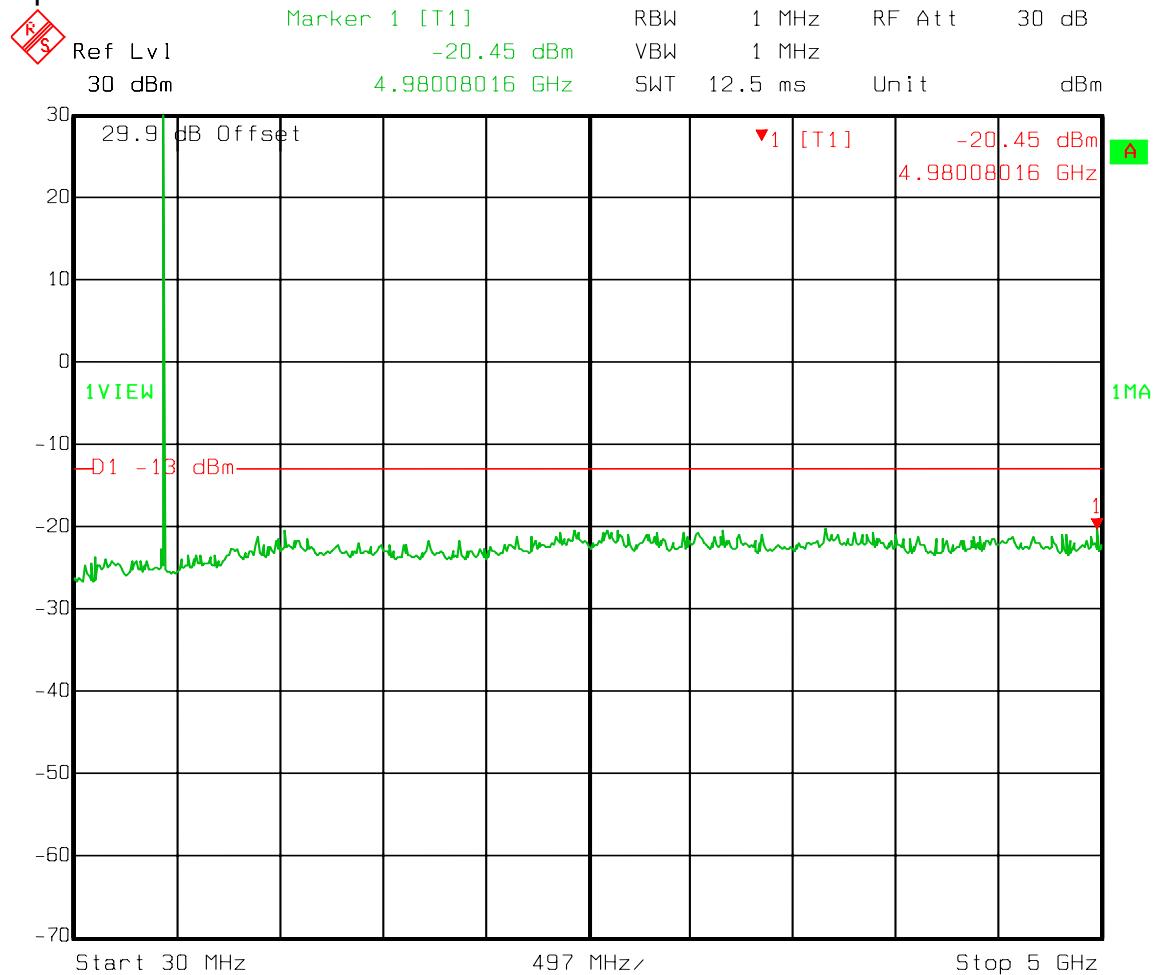
Upper Band Edge

Uplink



Date: 26.JUN.2008 10:11:09

Test Data – Spurious Emissions at Antenna Terminals

Spurs
Uplink

Date: 26.JUN.2008 09:37:45

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions PARA. NO.: 2.993

TESTED BY: David Light DATE: 25 June 2008

Test Results: Complies.**Test Data:** There were no emissions detected within 20 dB of the specification limit of -13 dBm, therefore none are reported per 2.1057(c).**Analyzer Settings:** Frequencies < than 1000 MHz: RBW/VBW = 100 kHz
Frequencies > than 1000 MHz: RBW/VBW = 1 MHz
Peak detector

The spectrum was searched from 30 MHz to 5 GHz.

Equipment Used: 993-1484-1485-1016-993**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %**Note:** See page A5 for applicable limit.

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/24/07	01/24/09
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1485	Cable	Storm PR90-010-216	N/A	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09

Nemko USA, Inc.

EQUIPMENT: FS31H-4X-USR

CFR 47 PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER
PROJECT NO.: 12296RUS1

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output**PARA. NO.: 2.985**

Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Method Of Measurement:**Detachable Antenna:**

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

NAME OF TEST: Spurious Emissions at Antenna Terminals	PARA. NO.: 2.991
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Minimum Standard: 90.210, Table 1**Table 1**

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

Test Method: RBW: 1% of emission bandwidth in the 0 - 1 GHz range.

1 MHz at frequencies above 1 GHz.

VBW: \Rightarrow RBW

The spectrum is searched up to 10 times the fundamental frequency.

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
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Minimum Standard: Not defined. Input/Output

Method Of Measurement:

Analog

Spectrum analyzer settings:

RBW=VBW=300 Hz

Span: 100 kHz

Sweep: Auto

iDEN

RBW=VBW= 300 Hz

Span: 100 kHz

Sweep: Auto

NAME OF TEST: Field Strength of Spurious **PARA. NO.: 2.993****Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.**Method Of Measurement:** TIA/EIA-603-1992

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

NAME OF TEST: Frequency Stability

PARA. NO.: 2.995

Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

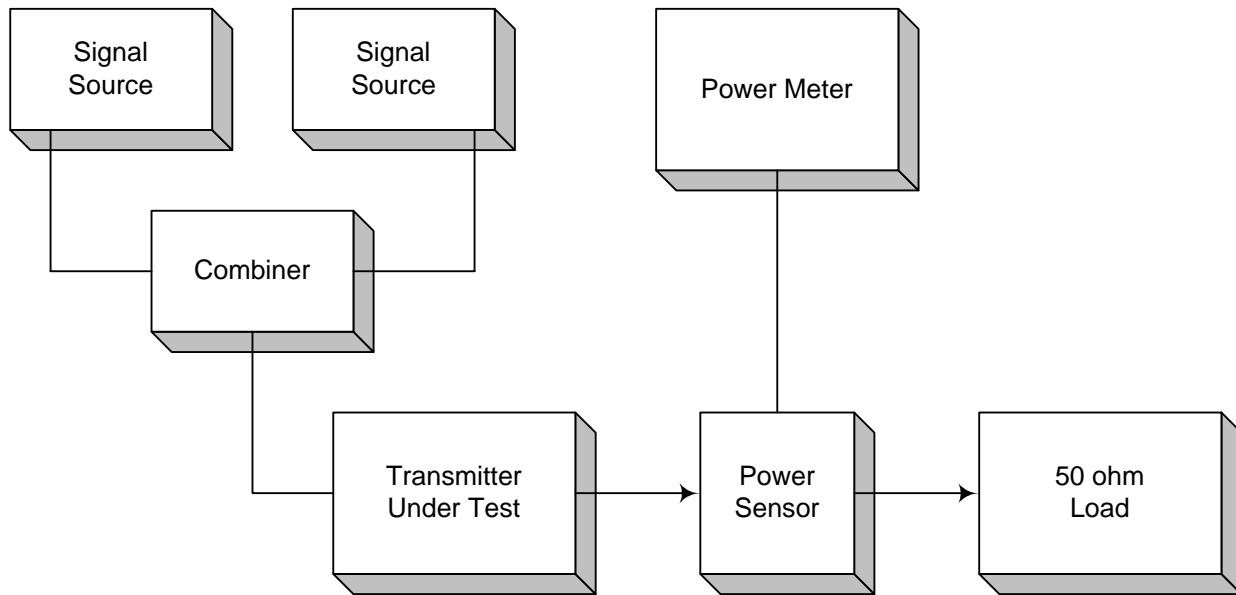
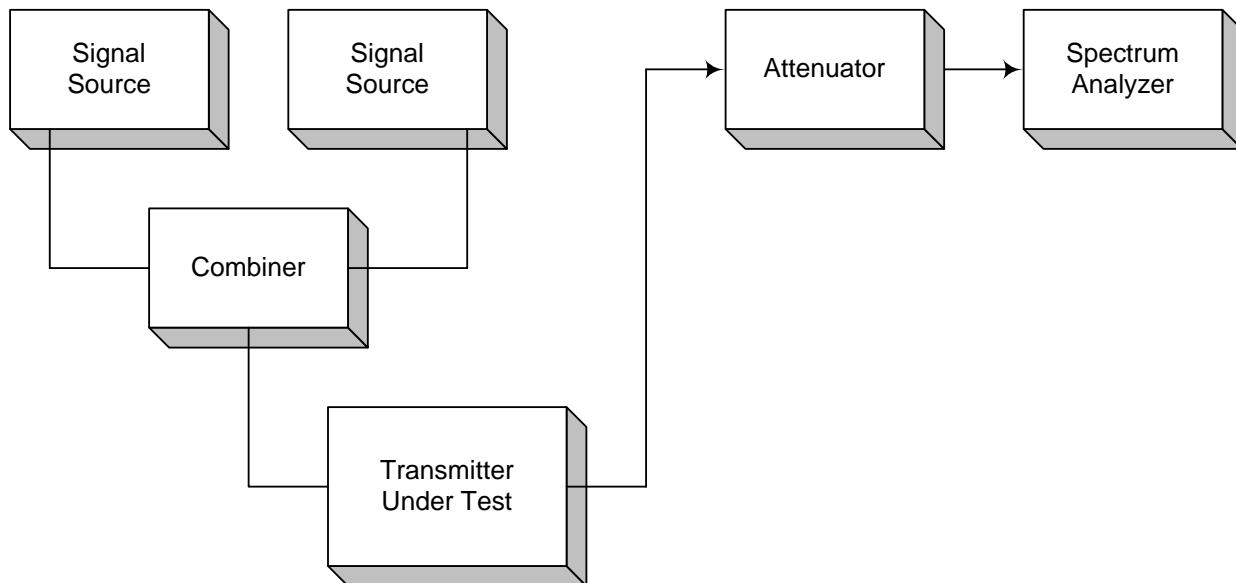
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

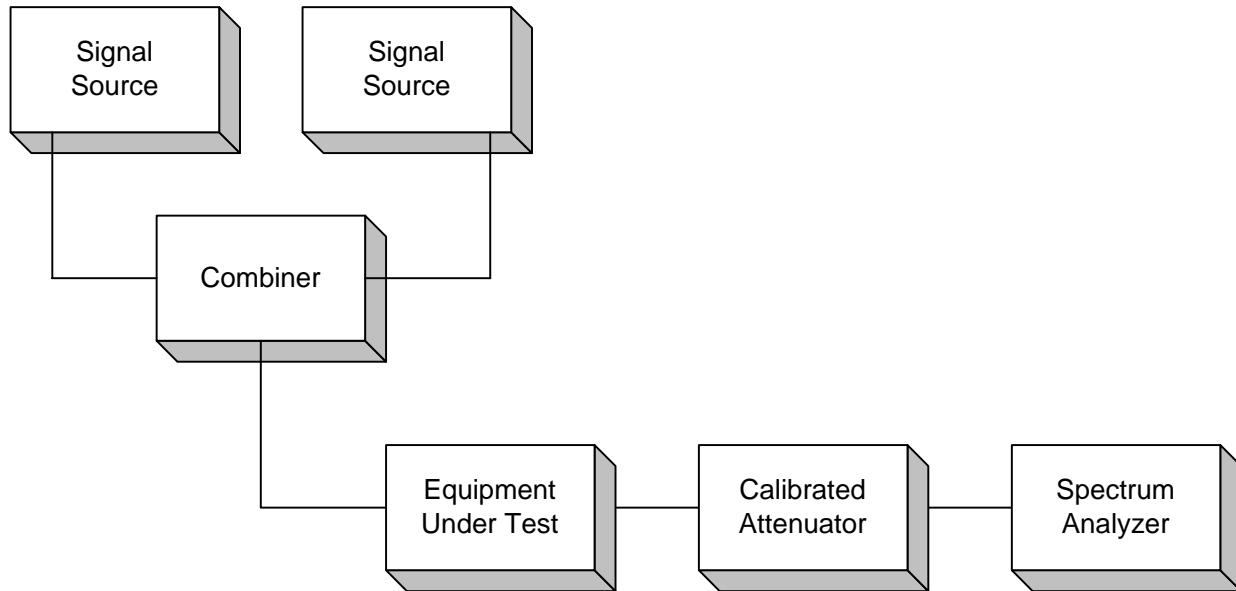
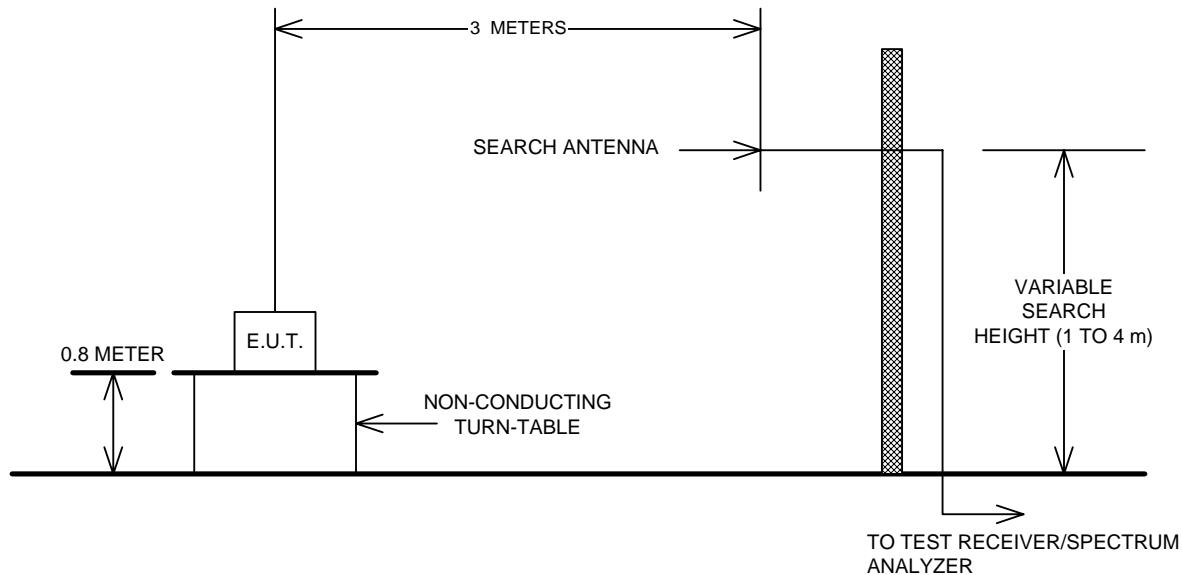
Nemko USA, Inc.

EQUIPMENT: FS31H-4X-USR

CFR 47 PART 90, SUBPART I
PRIVATE LAND MOBILE REPEATER
PROJECT NO.: 12296RUS1

ANNEX B - TEST DIAGRAMS

Para. No. 2.985 - R.F. Power Output**Para. No. 2.989 - Occupied Bandwidth**

Para. No. 2.991 - Spurious Emissions at Antenna Terminals**Para. No. 2.993 - Field Strength of Spurious Radiation**

Para. No. 2.995 - Frequency Stability

